

46. Method for representing and/or manufacturing an article of manufacture having a plurality of structural design variants comprising the steps of:

defining a plurality of positions each corresponding to a different predefined location on the article of manufacture; and

assigning at least one position variant to each position, each position variant identifying a specific part that may be used at the respective position in accordance with a particular design variant, so that, in a particular article of manufacture, only one of the at least one position variants can be selected for the respective position; and

defining a plurality of links each between particular pairs of positions, each link corresponding to a physical connection between parts in a pair of locations in the article of manufacture, which pair of locations corresponds to the respective pair of positions.

47. Method of claim 46, further comprising the step of:

assigning at least one connection variant to each link, each connection variant specifying a particular method of joining a part in a first position of the respective pair of positions to a part in the other position of the respective pair of positions.

48. Method of claim 46, further comprising the step of:

formulating a code rule for each position variant indicating when the particular variants should be selected in accordance with specified design options;

upon receiving an order containing specified design options:

evaluating the code rule for each position variant to select a specific position variant for each position and thereby identify a specific part for use in the location corresponding to the respective position;

providing the specific part associated with each selected position variant; and manufacturing the article of manufacture using the specific parts in the corresponding locations.

49. Method of claim 46, further comprising the step of:

assigning component documentation data to a predetermined set of position variants;

defining at least one assembly to be documented, said assembly comprising a plurality of positions and having a plurality of design variants ;

upon receipt of a customer order specifying selected design options:

determining the specific assembly design variant defined by the selected design options,

aggregating the documentation data assigned to the positions in the assembly, and storing the aggregated documentation data.

50. Method for determining manufacturing parts requirements to produce an article of manufacture having a plurality of structural design variants in accordance with at least one order specifying particular design options, the article of manufacture being described in a bill of materials BOM containing a plurality of position variant definitions, each position variant definition being assigned to a particular position corresponding to a physical location in the article of manufacture, each position variant definition further identifying a specific part and including a code rule indicating when the identified part should be used at the location corresponding to the particular position, wherein each code rule is a logical statement including one or more unique code rule elements; the method comprising the steps of:

extracting unique code rules from the BOM;

evaluating each unique code rule in accordance with the design options for each order;

mapping the evaluations of the unique code rules to the corresponding code rules in the position variant definitions in the BOM; and

determining the appropriate position variant definition to select for each position in accordance with the mapped code rule evaluations.

51. Method of claim 50, wherein:

each code rule comprises at least one code rule element corresponding to a selectable design option; and

the orders are contained in an order matrix which cross references each order against every code rule element.

52. Method of claim 51, wherein the step of evaluating each unique code rule comprises the steps of:

dividing each unique code rule into its discrete code rule elements;

linking each discrete code rule element with order data for the corresponding code rule element in the order matrix; and

evaluating each unique code rule in accordance with the order data linked to the associated discrete code rule elements.

53. Method of claim 52, wherein the step of dividing each unique code rule comprises the steps of:

factoring each unique code rule into one or more simpler code rule components; and  
dividing each code rule component into one or more discrete code rule elements; and  
the step of evaluating each unique code rule further comprising the steps of:

evaluating each code rule component in accordance with the order data linked to the associated discrete code rule elements; and

evaluating each unique code rule in accordance with the evaluated code rule components.

54. Method of claim 51, wherein each position variant definition has an associated validity period and the step of extracting unique code rules comprises extracting unique code rules only from those position variant definitions which have not expired at a specified start time based on the validity period.

55. Method of claim 54, wherein a sequence of orders in the order matrix indicates a time sequence of manufacture, the method further comprising the steps of determining, in accordance with the specified start time, a build time when the article of manufacture associated with each particular order will be manufactured;

the step of mapping comprising mapping the evaluations of the unique code rules to the corresponding code rules in the position variant definitions only for those particular orders which have a build time within the validity period of the respective position variant.

56. System for use in manufacturing an article of manufacture having a plurality of structural design variants, the system comprising:

a computer having a processor and a memory;

the memory including information representing a bill of materials BOM containing a plurality of position variant definitions, each position variant definition being assigned to a particular position corresponding to a location in the article of manufacture, each position variant definition further identifying a specific part, and including a code rule indicating when the position variant definition should be selected and thereby when the identified part should be used at the corresponding location;

the memory further including information representing at least one order specifying particular design options which define a particular design variant of the article; wherein each code rule for a particular design variant is a logical statement including one or more unique code rule elements;

the processor being configured to:

(a) extract unique code rules from the BOM and evaluate the code rules for each position variant definition in accordance with the respective design options for each order to identify an appropriate part for use in each location of the corresponding particular design variant of the article; and

(b) produce an output indicating for each order the appropriate parts for use in the corresponding particular design variant of the article;

the particular design variant defined by a specific order being manufactured using the parts indicated for that specific order.

57. System of claim 56, wherein the processor is configured to evaluate the code rules by:  
mapping the evaluations of the unique code rules to the corresponding code rules in the position variant definitions in the BOM; and  
determining the appropriate position variant definition to select for each position in accordance with the mapped code rule evaluations.

58. System of claim 57, wherein:  
each code rule comprises at least one code rule element;  
each design option corresponds to a respective code rule element; and  
the orders are contained in an order matrix which cross references each order against the code rule elements;  
the processor being further configured to evaluate each unique code rule by:  
dividing each unique code rule into its discrete code rule elements;  
linking each discrete code rule element with order data for the corresponding code rule element in the order matrix; and  
evaluating each unique code rule in accordance with the order data linked to the associated discrete code rule elements .

59. System of claim 58, wherein:

the processor is configured to divide each unique code rule by factoring each unique code rule into simpler code rule components and dividing the code rule components into discrete code rule elements;

the processor being further configured to evaluate each code rule component in accordance with the order data linked to the associated discrete code rule elements and evaluate each unique code rule in accordance with the evaluated code rule components.

60. System of claim 57, wherein each position variant definition has an associated validity period; and

the processor is configured to extract unique code rules only from those position variant definitions which are not expired at a specified start time in accordance with the associated validity period.

61. System of claim 60, wherein:

the orders are contained in an order matrix stored in memory wherein the sequence of orders in the order matrix indicates a time sequence of manufacture of said orders;

the processor being further configured to:

determine, in accordance with the specified start time, a build time when the article of manufacture associated with each particular order will be manufactured; and

map the evaluations of the unique code rules to the corresponding code rules in the position variant definitions only for those particular orders which have a build time within the validity period of the respective position variants.

62. Computer program for manufacturing an article of manufacture having a plurality of structural design variants, said computer program being stored on a storage medium and comprising:

a program module defining a plurality of positions each corresponding to a different predefined location on the article of manufacture;

a program module assigning each position a unique position ID;

a program module assigning at least one position variant to each position, each position variant identifying a specific part that may be used at the location corresponding to the respective position and having a related code rule indicating when the particular position variant should be selected in accordance with specified design options;

a program module which, upon receiving an order containing specified design options:

evaluates the code rules for each position variant to identify an appropriate part for use in each position; wherein the program module evaluating each unique code rule further comprises:

- a program module dividing each unique code rule into its discrete code rule elements;
- a program module linking each discrete code rule element with order data for the corresponding code rule element in an order matrix which cross references each order against the code rule elements; and
- a program module evaluating each unique code rule in accordance with the order data linked to the associated discrete code rule elements.

63. Computer program of claim 62, further comprising:

a program module defining a plurality of links each between particular pairs of positions, each link corresponding to a physical connection between parts in a pair of locations in the article of manufacture, which pair of locations corresponds to the respective pair of positions; and

a program module assigning at least one connection variant to at least one link, each connection variant specifying a particular method of joining a first part in a first position of the respective pair of positions to a second part in the other position of the respective pair of positions, each connection variant having a related code rule indicating when the particular connection variant should be selected in accordance with specified design options.

64. Computer program of claim 63, further comprising:

a program module evaluating the code rules for each connection variant to identify an appropriate method of joining the identified parts for the corresponding pair of positions in response to the receipt of an order containing specified design options; and

the manufacturing program module using the identified method to join the respective identified parts.

65. Computer program for determining manufacturing parts requirements to produce an article of manufacture having a plurality of structural design variants in accordance with at least one order specifying particular design options, the article of manufacture being described in a bill of materials BOM containing a plurality of position variant definitions, each position variant definition being assigned to a particular position corresponding to a location in the article of manufacture, each position variant definition further identifying a specific part and

including a code rule indicating when the identified part should be used at the location corresponding to the associated position, the computer program being stored on a storage medium and comprising:

a program module extracting unique code rules from the BOM;

a program module evaluating each unique code rule in accordance with the design options for each order;

a program module mapping the evaluations of the unique code rules to the corresponding code rules in the position variant definitions in the BOM; and

a program module determining the appropriate position variant to select for each position in accordance with the mapped code rule evaluations, wherein each code rule comprises at least one code rule element corresponding to a selectable design option and the orders are contained in an order matrix which cross references each order against the code rule elements.

66. Computer program of claim 65, wherein each position variant definition has an associated validity period and the program module extracting unique code rules comprises a program module for extracting unique code rules only from those position variant definition which have not expired at a specified start time in accordance with the validity period.

67. Computer program of claim 66, wherein a sequence of orders in the order matrix indicates a time sequence of manufacture of said orders, the program further comprising:

a program module determining, in accordance with the specified start time, a build time when the article of manufacture associated with each particular order will be manufactured; and

the mapping program module comprises a module mapping the evaluations of the unique code rules to the corresponding code rules in the position variant definitions only for those particular orders which have a build time within the validity period of the respective position variant definition.

68. Computer program of claim 66, further comprising a program module repeating the mapping step upon receipt of a resequenced order matrix to determine revised manufacturing parts requirements in accordance with the resequenced order matrix.